

(No Model.)

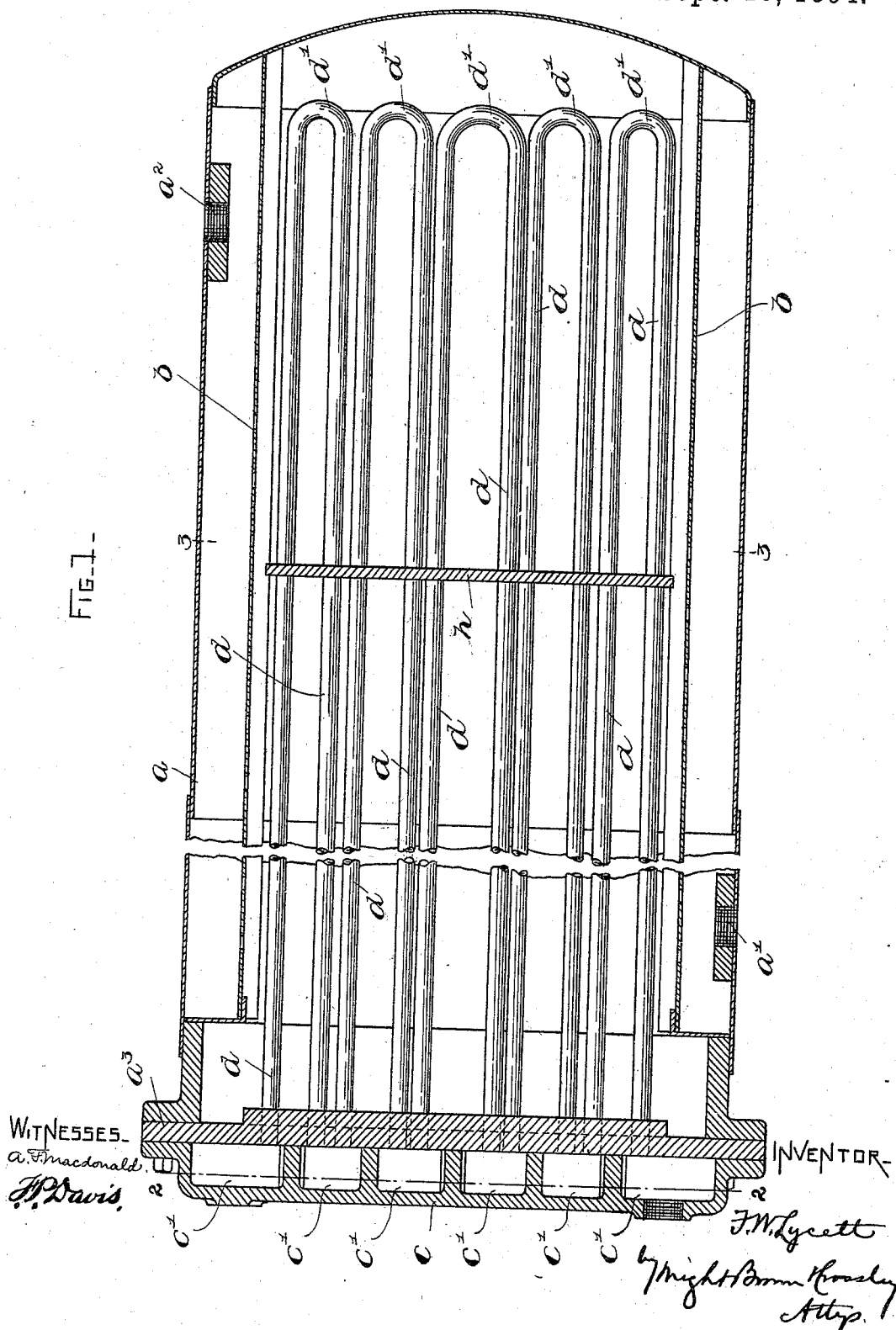
2 Sheets—Sheet 1.

F. W. LYCETT.
FEED WATER HEATER.

No. 526,188.

Patented Sept. 18, 1894.

FIG. 1.



(No Model.)

2 Sheets—Sheet 2.

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FIG. 2.

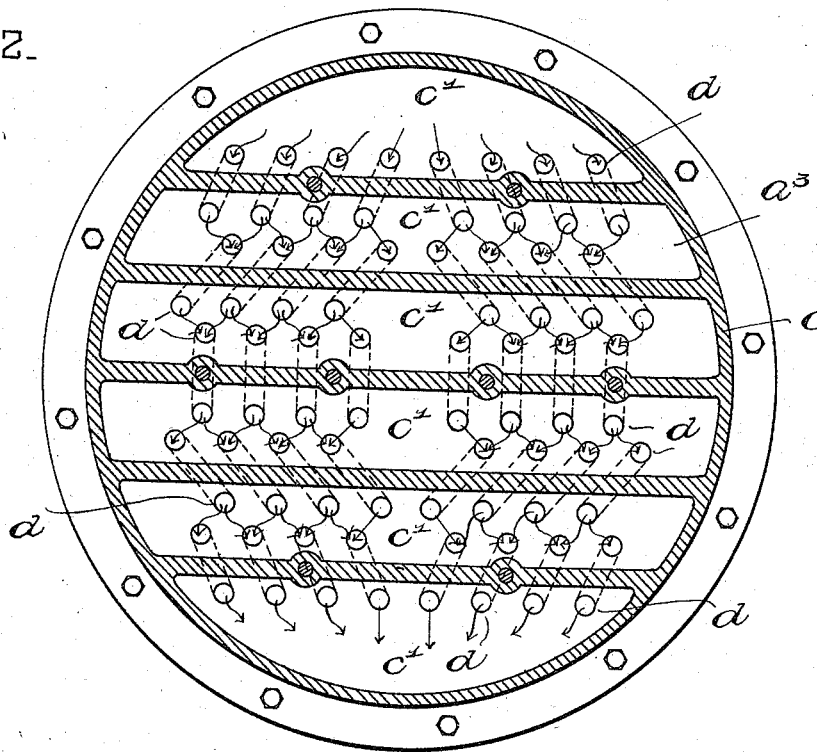
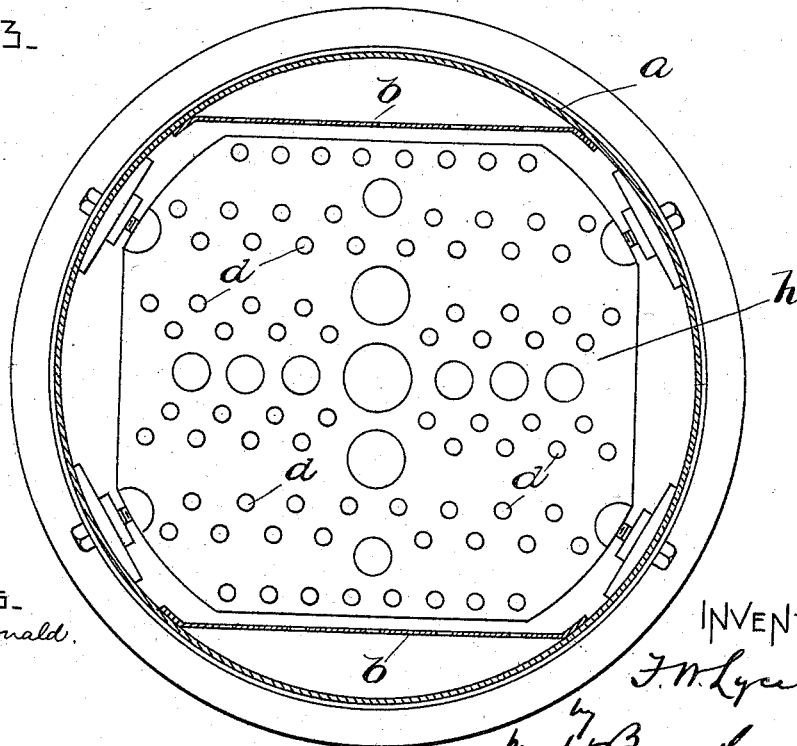


FIG. 3.



WITNESSES.
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INVENTOR.

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by
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UNITED STATES PATENT OFFICE.

FREDERICK W. LYCETT, OF HARTFORD, CONNECTICUT, ASSIGNOR TO JOHN O. DAVIS, OF SAME PLACE.

FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 526,188, dated September 18, 1894.

Application filed April 19, 1894. Serial No. 508,109. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK W. LYCETT, of Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Feed-Water Heaters, of which the following is a specification.

This invention relates to that class of steam-generator feed-water heaters employing return tubes for circulating exhaust-steam in a casing through which the feed-water passes, with the object of extracting the heat of the exhaust-steam and utilizing it to heat the feed-water.

The object of my invention is to more thoroughly accomplish this result by providing large areas of heat-radiating surface and insuring a more extended distribution of the exhaust-steam than heretofore, due regard being had at the same time for compactness.

To the above ends the invention consists in certain novel features of construction and combinations of parts hereinafter described and claimed.

The accompanying drawings illustrate a construction embodying the invention.

Figure 1 shows a longitudinal section of the heater. Fig. 2 shows a cross-section on line 2—2 of Fig. 1, broken lines indicating the return bends of the pipes. Fig. 3 shows a cross-section on line 3—3 of Fig. 1.

The letter *a* designates a cylindrical casing closed at both ends and having an inlet opening *a'* in the under side near one end for the entrance of the feed-water, and an outlet opening *a''* in the upper side near the opposite end for the discharge of the feed-water. Perforated baffle-plates *b* extend over the openings *a'* and *a''* respectively and throughout the length of the shell to which they are riveted. These baffle-plates may, however, be dispensed with.

A casting *c* is secured on one head *a''* of the shell *a* and is formed with a series of horizontal chambers *c'* in its inner side and having their front sides closed by the head *a''*. The upper one of the said chambers has an opening for admission of exhaust-steam or condensation from an engine, and the

lower chamber has an opening for the discharge of this exhaust-steam or the condensation thereof.

A system of return-tubes connects the chambers and extends throughout substantially the whole length of the shell, the arrangement being as follows: Each return-tube comprises two parallel lengths *d* entered at the forward end through the head *a''*, and connected at the opposite end by a return-bend *d'*. One length of tube communicates with one chamber *c'* and the other with the adjacent chamber. The tubes are arranged in horizontal tiers and those composing the upper tier connect the upper chamber with the next chamber below, and those at one side of a central vertical line of the shell are disposed at varying degrees of inclination in one direction, the degrees of inclination increasing toward the said central line, whereas those on the other side of said central line are disposed at correspondingly varying degrees of inclination in the opposite direction. (See Fig. 2.) The tubes of the next tier connecting the second and third chambers are lengthwise disposed, those at one side being inclined in one direction, and those on the other side in the opposite direction, and the tubes composing this second tier are staggered with respect to the tubes composing the first tier, so as to throw the ends of the tubes of different tiers which issue in the same chamber out of vertical alignment.

The third tier of tubes connecting the third and fourth chambers are disposed vertically and staggered with respect to the tubes of the second tier to secure the same relative position of the ends of the tubes as above described. Two other tiers of tubes on the lower sides of the central tier and connecting the fourth and fifth, and the fifth and sixth chambers, are arranged the same as the two above the central one.

In operation the exhaust-steam or condensation entering the upper chamber passes through the tubes composing the upper tier and is delivered thereby into the chamber next below, whence it passes into the tubes of the second tier as indicated by the arrows

in Fig. 2 and is conducted thereby to the chamber next below, and so on to the bottom chamber.

5 The heat of the exhaust-steam is extracted by the feed-water, and the resultant condensation is discharged from the lower chamber together with oils and other foreign matter, which accompany the exhaust-steam.

10 It is to be noted that there is no admixture of the exhaust-steam and the feed-water.

By my staggered arrangement of the return-tubes I secure a more thorough distribution of the exhaust-steam than if the tubes were in vertical alignment, for with the staggered arrangement the discharging ends of one tier of tubes enter the chamber out of vertical alignment with the receiving ends of another tier of tubes, and causes an extended distribution of the exhaust-steam throughout the chamber.

The angular disposition of the tubes hereinbefore described adapts them to a prescribed compass in which to include them, and secures large areas of heat-radiating surface.

25 The pipes are sustained at the back of the shell by a support in the form of a perforated plate *h*, through which the pipes extend, and which is bolted through suitable lugs to the shell.

30 Having thus explained the nature of the

invention, what I claim as new, and desire to secure by Letters Patent, is—

A feed-water heater comprising in its construction an exterior casing, a head on one end of said casing having a number of horizontal partitions forming separated chambers, and tiers of return tubes extending longitudinally within the casing, each tier connecting adjacent chambers in the said head and said tiers comprising outer tiers the return-tubes of which at one side of a central vertical line are inclined in one direction in varying degree, while those at the other side of said line are correspondingly inclined in the opposite direction, intermediate tiers whose tubes are inclined substantially as those of the outer tiers and staggered with respect thereto, and a central tier whose tubes are staggered with respect to those of the intermediate tiers, all substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 14th day of April, A. D. 1894.

FREDK. W. LYCETT.

Witnesses:

ARTHUR W. CROSSLEY,
A. D. HARRISON.